Analysis of Heart Rate Variability in Male and Female Rats.

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Heart disease is the leading cause of death in the United States. Quantitative measures of cardiovascular function are often essential to effective clinical interventions. The QRS complex is one such measure widely used by cardiologists. These analyses can involve subtle changes in the magnitude and time course of the QRS complex, to differences in the timing between successive heart beats. Electrocardiograms (ECG) are continuous recordings of the QRS complex at various locations across the body surface and provide a comprehensive measurement of the electrical activity of the heart. Knowledge obtained from investigating ECG signal characteristics can help the cardiologist diagnose possible health or cardiac abnormalities such as arrhythmias and can provide objective measures of heart health following injury such as myocardial infarction. Heart rate variability (HRV) can also serve as a reliable indicator of heart health and has been shown to be a strong indicator of mortality and morbidity following myocardial infarction. Unfortunately, very little is known concerning the neurophysiological mechanisms underlying HRV beyond the broader impact of the autonomic nervous system and associated neurocirculatory reflexes. In this research project, we first implemented several established methods for quantifying HRV in male and female rats such as calculating the power spectral density of a long time series of HRV measures, and calculating the standard deviation of the averages of all beat-to-beat intervals in the recording. These measures compared well to those in the literature supporting the accuracy and reliability of the Matlab scripts created to process these data. Simultaneous recordings of the QRS complex and femoral arterial pressure (BP) provided the opportunity to determine how well BP recordings could be used to quantify HRV. In addition, HRV measurements were compared across populations of male and normal, cycling (OVI) and ovariectomized (OVX) female rats in order to determine if HRV is sexually dimorphic.

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